VOL. XVIII, No. 17. AUGUST 18, 1921

THE JOURNAL OF PHILOSOPHY

THE NEED OF A NEW ENGLISH WORD TO EXPRESS RELATION IN LIVING NATURE

PART I

I

NATURAL bodies stand in different kinds of relation to one another. This is so obvious that it can not escape the notice of anybody. Indeed, the fact of its being before the face and eyes of every person all the time largely accounts for its so seldom getting reflective attention. That a telegraph pole set in the ground is differently related to the earth from what a growing tree is; that the relation between the crystals in a granite boulder are different from that between, say, a lichen growing on it and a hammer which may have been laid on it by a workman; and that a lady's finger is differently related to her hand from what her finger ring is to the finger on which she wears it, are all such commonplace facts that for ordinary purposes they neither get nor need special attention.

But the time comes, if one is bent upon knowing the world through and through, and of making the most possible of it, when these cursorily noticed different kinds of relation have to be closely examined.

Many different English words are used to designate relation between bodies: coordination, correlation, union, cooperation, conjunction, combination, interaction, interdependence, are some of the more common of these. And some aspects of the idea about what relation is have received great attention. For example, not many subjects have held a more important place in speculative philosophy. The subjectivistic idealism that has so dominated modern philosophy down to a few years ago has conceived relation to pertain fundamentally to the domain of judgment, the entire world being conceived as belonging to this domain. To present the argument advanced in support of this conception "would almost be," says J. M. Baldwin, "to write the history of metaphysical logic since the time of Kant."

But even in the logic and theory of knowledge now necessitated from recognizing the inadequacy of the Kantian system, relation has a prominent place. Says John Dewey, "relation is, directly or indirectly, the central thing in knowledge." Similarly, L. E. Hicks, the author of "Normal Logic or the Science of Order," writes: "It is questionable whether any sort of mental activity whatever can be

mentioned which does not involve relations" (this JOURNAL, July 15, 1920). And another writer, A. E. Avey ("The Present-Day Conceptions of Logic," *Phil. Rev.*, XXVIII, 4, p. 405), has defined logic as the science of relations.

It is a noteworthy and, it seems to me, highly significant fact, that although all the sciences into which the mind enters as subject matter have given much attention to the general problem of relation, and although the physical and biological sciences are so largely occupied with particular relations among the objects of nature, these latter sciences have considered but little the general or common nature of the various relations with which they deal.

From this standpoint, the great prominence into which one aspect of relation in physical nature, that, namely, known as relativity, has recently come, is peculiarly interesting.

The present study is concerned primarily with an aspect of relation in organic nature that is coming to be widely referred to under the term integration. I have used the term myself quite extensively, especially in *The Unity of the Organism.*

But experience and reflection, largely since *The Unity* was published, have led me to recognize that the word is used by different workers in different portions of that realm, with meanings or at least with implications that are sometimes strongly at variance with one another and rarely, if ever, with full justice to the phenomena to which they are applied. Because of these defects I have become impressed with the importance of subjecting the phenomena to careful examination with a view to a better understanding of them, and to a better way of utilizing and expressing them.

I shall specify one of the clearest, most important of these discrepancies in the use of the word integration.

The lexicon definitions of integration often contain the idea that disintegration is its antithesis or opposite. "Integration is the act of bringing or process of bringing together as parts of a whole, disintegration the act or process of separation into component parts." (*Dict. of Phil. and Psychol.*) Sometimes this idea is expressed inferentially rather than explicitly. Thus restoration or renewal are not infrequently given as definitive of integration, the clear implication being that destruction or disintegration had previously taken place.

It is not my purpose, of course, to contend that this meaning for integration is incorrect when a comprehensive definition of the word is being sought.

The point I would make is that when understood in this sense it is not only inadequate but is very misleading as frequently applied to living beings. For example, the assimilation of food by an organ-

ism is manifestly not a process of integration in the sense of restoring the tissues and organs by recombining the parts of the organism which had previously existed in a separated or disintegrated condition. Organic assimilation consists not only in bringing the food particles into connection with the organism's tissues and organs, but of transforming the particles from what they were *as food* into other particles now existing *as tissues and organs* of an organism, though it may be counted as integration when viewed as a process which opposes or counteracts disintegration.

Clearly, then, when we are dealing with some of the most distinctive of the relating and combining phenomena of living beings, if we apply the term integration to them it is greatly important that we recognize the necessity of giving it a meaning the opposite of which does not imply disintegration or destruction. Indeed, so important has it seemed to me latterly that relation in living beings of the sort now in mind be kept more clearly in view that I have given considerable time to searching for a word that would better express such relation than does integration.

The circumstance that *differentiation* is used to express the coming into existence of new parts—tissues, organs, *etc.*—in individual development, has been useful in this search. Hardly any word is more prominent in the general vocabulary of organic development than is this, and there is almost no ambiguity as to its meaning. But so obvious is it that such development consists not only in the coming on of new parts, but as well in the establishment of proper relations among them, that to-day no competent student would define individual development, or ontogeny, without bringing into the definition reference to the relating as well as to the producing of parts. And when a single word is used as the correlate of differentiation that word is very apt to be integration. Now the word integration has grown, as one readily sees, from another root than that from which differentiation takes its origin.

The Latin *gradior* upon which integration is founded has no other implication, it appears, than that of moving step by step as in walking, while *ferre,* the root part of differentiation, had as one of its original meanings, so the Latin lexicons inform us, that of bearing in the sense of producing, even to the producing of offspring by parents. This last meaning of the word gives it special fitness as a biological term, so vitally distinctive of life is production by birth and growth. To-day no phenomenon of living beings is regarded as adequately dealt with until it has been tried by the established principles of organic genesis. Manifestly, then, differentiation comes closer home, so to speak, as a name of developmental processes than

does integration. This being so, what we really need to express the relating aspect of development is a word which contains the *ferre* root of differentiation, as well as a prefix expressing the antithesis of the *dif* of differentiation. Now the prefix which most commends itself for this is *con*. But unfortunately the English language recognizes no combination of a derivative from *ferre* with the prefix *con*, which is homologous with differentiate. Conference presents the combination of course. But in common usage this has a very different meaning from a true antithesis of differentiate as a term of organic development. A conference between two or more persons is an incidental, even though planned meeting of these for a special purpose, and always implies their separation when the purpose for which they met has been accomplished. This is manifestly very different from the togetherness of the parts of an organism. A complete separation of such parts, as the members of a conference separate, means the death of one and all; whereas it means not even so much as an injury to the separated participants in a conference.

Conferentiate, the obvious developmental antithesis of *differentiate*, does not occur in any dictionary I have been able to consult. Yet this word with its derivatives seems to be exactly what the science of organic development needs to express the relational aspect of the process. Ontogeny could then be succinctly and concisely characterized as the *process of differentiation and conferentiation of the individual organism*. The clear implication would be that whatever the conditions and forces which bring into existence new parts of the organism, conditions and forces exactly corresponding to these, though in a sense opposite in character, must be operative in all development that is biologically organic. It would be a great misfortune were the word integration to get a secure place in the popular language of organic science, always having the implication that its antithesis is disintegration. But there is some danger of just this happening as I am convinced from several things which I have recently seen and heard.

The difference between integration and conferentiation may be still more sharply expressed by saying that integration is essentially a preservative, while conferentiation is not only preservative but is also constructive and progressive. The assimilation of food by the tissues is integrative, though, as previously pointed out, not conferentiative. This illustration is apt enough so far as concerns assimilation in a *full grown* organism. When, however, a *growing* organism is considered, one may ask whether assimilation is then integrative or conferentiative. The answer is that even assimilation during growth is fundamentally different from the process for which the term con-

ferentiation is suggested. For one thing this difference is seen in the fact that assimilation results in the *complete transformation* of the food material into the growing tissue, organ, etc.; whereas the conferentiative process never results in the complete transformation or loss of identity of either of the interacting bodies. There is a reciprocality of action and effect in conferentiation that is absent in assimilation.

The coining of words I look upon as justifiable only under very urgent demands. But it appears to me the situation here indicated constitutes such a demand. I have, consequently, decided to use the word *conferentiate* and its derivatives, conferentiation, conferentiated, *etc.*

II

With these reflections as a base of operations, we may now proceed to examine in some detail the group of relational phenomena, the generalized name for which I am proposing the new word *conferentiation.*

The examination will be facilitated by noticing at the outset the limits within which the relation between organic bodies results in recognizable influence upon each other of the bodies concerned. Those limits obviously are, for one thing, the slightest recognizable influence at one extreme, and the greatest at the other.

Attending first to the side of minimum influence, let us take some instance in which the relation between two organic bodies has as little influence upon them both as any we know. Consider, for example, a banana plant in Hawaii and an Esquimau in Labrador. That these stand in *some sort* of relation to each other, no person who thinks carefully will question for a moment. That both may be visited by one and the same traveler and described in terms familiar to great numbers of persons using the same language as that used by the traveler, surely constitutes a kind of relation. But yet—and this is the main point in this example—the relation here is so remote that its influence upon the two organisms as they now exist and have existed during their entire lives is practically nil. It is negligible, as we say. Probably no one could discover that either would have been in the slightest degree different from what it is had the other never existed. The working naturalist who deals in any way with either one will be justified in wholly ignoring, so far as his actual investigation is concerned, the possibility that the other may have influenced the one he is studying.

Nevertheless, as a thoroughgoing naturalist, he can not wholly ignore such possibility. For instance, what about the law of univer-

sal gravitation? If, as this law says, every particle of matter in the universe attracts every other particle, then surely the Labradorian Esquimau can not escape the gravitational influence of the Hawaiian banana plant; and vice versa. What the practical naturalist does and does perfectly justifiably, is to *assume* that the present status of his science, botany or anthropology, as the case may be, does not require him, indeed does not permit him, to pay any attention to the gravitational relations between these two bodies.

Such reflections give an important cue for procedure in carrying out the proposed examination. This cue indicates that it will be advantageous to go to inanimate nature for criteria of relational influence within animate nature. This is so partly because organic science has not yet any such exact tests of the influence exerted by living bodies upon one another when they are far apart, as inorganic science has through its knowledge of, for example, that influence known as gravitation. This knowledge, as all educated persons know, puts into the hands of scientists tests of the gravitational influence of bodies, both animate and inanimate, upon one another which are readily applicable at any time, and are easily statable in both qualitative and quantitative language.

Notice now what comes to light when such tests are applied to the gravitational influence of, say, the heavenly bodies upon one another. It is one of the commonest of commonplaces of natural knowledge since Newton, that the whole state of nature, both earthly and heavenly, is dependent upon this influence—that the "*state* of nature" is an "*order* of nature" just because of it.

So profound, indeed, is the influence that we can not picture, even in imagination, with any degree of clearness what the state of nature would be were the influence to cease. It almost seems as though without it nature itself could not exist. So here is a kind of relation in which the related bodies though far apart, many of them enormously far apart, yet influence one another very profoundly, at least so far as their "movements in space," as we say, are concerned.

But does the influence stop with its effect upon the movement of the bodies in space? Certainly not. The ocean tides come forward as an unimpeachable witness to the great influence upon a portion at least of the structure of one body, the earth, due to its relation with other distant bodies of comparable size. And here we come upon another striking result of applying the tests for relational influence now possessed by science: not the ocean merely—the portion of the earth which at present is most susceptible of being moved somewhat independently of the rest—but all its parts, no matter how solid, are also moved with a slight degree of independence of the

rest, by this same relational influence. The earth tides, in other words, now being detected and measured, bear witness to a slight measure of independent movement of all parts of the earth under the relational influence called gravitation. The entire earth body suffers deformation to a minute extent from its gravitational relation with moon, sun, and, in theory at least, all other heavenly bodies. *This deformation may be looked upon as the price which the earth pays in terms of its individuality for being held and guided in its individual career within the general order of nature.*

But here comes a point of major significance for the study we are making: although the tides of the earth constitute something of an impairment, so to speak, of its bodily form and structure, this is not enough to constitute a real injury to it or even to obscure its identifiability in the least. Although ordinary geography must, and does, take notice of ocean tides, especially along certain coasts where the rise and fall and flow of water are excessive owing to peculiar land conformations, no one thinks of the contemporaneous earth as anything else than itself, because of, or even as essentially altered by, the tidal movements of either its fluid or solid constitutents. So is it, I say, with the earth of the present era. As to the effects of such movements through geologic and astronomic time, that is quite another matter, but one which this very general examination of natural relation does not require us to notice further.

So much by way of illustration of relational influence upon natural bodies where such influence, though fundamentally determinative of the very existence of the bodies, yet affects their individuality to only a slight extent—to an extent so slight as not to constitute any impairment of their identifiability.

Now let us turn to an example of the opposite extreme of relational influence. And here again inanimate nature furnishes the most striking and best known examples. They come from that kind of relation between bodies known as chemical.

An instance which well exemplifies the principles involved is familiarly at hand in the "chemical" relation between the two bodies (more frequently called substances in such cases), sodium and chlorine. As is known to every one who has done any practical work in elementary chemistry, sodium is a white metal having a silvery luster. At ordinary temperatures it has the consistency of wax, but at 20° below zero, Centigrade, it is quite hard and very ductile. It melts at about 95°, appearing then as a liquid resembling mercury, and at 742° it boils and vaporizes, the vapor having a "peculiar purple color" when seen in quantity by transmitted light. Under proper conditions it takes on the crystalline form, the

crystals belonging to the quadratic axial system, their shape being acute octohedral. It is slightly lighter than water so that it floats when thrown on cold water, but then undergoes rapid dissolution.

The other body, chlorine, is a gas at ordinary temperature and pressure, but with a little lowering of either temperature or pressure or both combined, it becomes a yellow liquid, having a specific gravity of 1.33. Although transparent, chlorine has a greenish-yellow color and when in small quantity has an odor resembling seaweed. But when in large quantity its smell is extremely offensive and suffocating and is unlike that of any other known substance. As to weight, it exceeeds that of ordinary air about two and a half times.[1]

Now the relation between bodies which we call chemical produces such profound influence upon the bodies concerned that often, indeed usually, not a single one of their original attributes remains after the interaction is complete. The individuality of each entirely disappears. Or, otherwise stated, so far as concerns the portions of the bodies actually participating in the reaction, and so far as concerns our original knowledge of them, both are gone absolutely—are destroyed—by their action upon each other, and in place of them a third body, common table salt in the example chosen, wholly different as to identifying attributes from either of the originals, has come into existence. The identity of the interacting bodies is entirely lost instead of being only very slightly modified as in the case of the astronomically related bodies.

Nor can we, consistently, even with a purpose so non-chemical as this examination, neglect to notice one feature about the new body,

[1] The partial inventory of the attributes of these two bodies is taken essentially from the *Treatise on Chemistry* by Roscoe and Schorlemmer. I must avail myself of this opportunity for calling attention to what, from the standpoint of the mental technique of natural knowledge, is a rather serious defect in many text books of chemistry. This is in the failure of their authors to put down, explicitly, at the beginning of the treatment of each chemical substance, enough of its defining attributes to establish firmly in the student's mind an irreducible minimum of the foundation of all our knowledge of the substances. To the experiences of a working chemist it seems quite useless to hark back constantly to the elementary description of the substances with whieh he deals, so little do many of the attributes enter as such into his operations and calculations. But once one recognizes fully the tendency of the human mind to wander off into unsubstantial abstraction, and sees the dire consequences which such wanderings have had in the history of human knowledge, he will be duly impressed with the importance of so grounding the neophytes of science in the indispensables of observational knowledge that they shall never become the victims of speculation, the objective foundations of which have been torn out and cast aside.

I am quite of the opinion that even the ordained priests of science sometimes substitute the bodiless creations of their own minds for the stones of nature at critical places in the temples they build.

table salt (sodium chloride), which has been produced by the interaction between the old bodies, the sodium and the chlorine; the new body differs from both the old ones in such a way as to make it quite impossible to tell which, if either, of the originals, was the cause of the attributes of the new body. For instance, is the pure white of the salt caused by the yellowish-green of the chlorine; or by the "peculiar purple" of the sodium vapor; or by both operating together; or by neither of these, but by something else about either sodium or chlorine or both? Again, is the particular crystal form of the salt, belonging to the regular or cubic system, caused by the crystal form of the sodium, this being said to crystallize in the very different octohedral form belonging to the quadratic system? To the practical chemist questions of this sort are likely to be taken as indicating an ignorance of modern chemical ideas that is worse than puerile because being a show of knowledge that is mere pretense. No tyro in chemistry now imagines, he may say, that the properties of chemical compounds arise in any such way as is here implied. It is all a matter of molecules, atoms, electrons, *etc.*, we are told, the sensible, superficial attributes being in no wise causally concerned. But here is where the cogency of our questioning comes in. If we are really going to stand for the validity of observational knowledge—that is, are going to adhere to the principle that but for a substratum of such knowledge we could have no knowledge about any thing—then we are bound to recognize that no matter what order of constituents of the substances with which we deal, their sensible qualities, observed or unobserved, are what we must depend upon for anything intelligible we can possibly say about either chemical simples or chemical compounds, as to structure and function, or as to cause and effect. Consequently, so long as we are in almost total darkness concerning the details of how sensible qualities of constituent simples are related to sensible qualities of compounds, the only thing we can say, speaking of causes, is that the sensible qualities of the reacting simples *taken altogether,* somehow produce the sensible qualities of their derivative compound *taken altogether.* In the all but total absence of detailed observational knowledge of the causal factors in the transformations which characterize that relational influence known as chemical, we are obliged to be satisfied to describe the process and the results in *general,* or *mass, terms.* We are certain that an observed and measured quantity of chlorine taken in its entirety, and an observed and measured quantity of sodium also taken in its entirety, by acting upon each other under proper conditions, always produce an observable and equal quantity of "table salt." But there certainty as to causal details ends. Consequently, in so far as chem-

ists set aside the language of these observable facts and substitute therefor the language of the supposed molecular, atomic, and electronic processes involved, they are really setting aside an extremely important portion of certain knowledge and substituting for it uncertain, or speculative, knowledge.

The central point in these reflections for our purpose is that the only region of certainty in which we can move when dealing with relations of the sort known as chemical, is really a region of *wholes* much more than of the constitutent parts of these wholes, exactly as was the case when dealing with gravitational relation. So far as the present state of science enables us to go, the only thing we are certain of as to the origin of the attributes of bodies produced chemically is that they result from the *combined action* of the attributes of the original or parent bodies.

Returning now to our quest for a criterion of relational influence in the living world, see what we have done toward setting limits of such influence generally. At one extreme (gravitational interaction) we have observed that although the influence of the relation on each of the bodies is profoundly determinative in certain respects, still the individuality and identifiability of the bodies are unimpaired.

At the other extreme (that of chemical interaction) the individuality and identity of the bodies are, on the contrary, wholly lost, the bodies having to all appearances completely funded or pooled their attributes in a new body.

But since natural science has now progressed so far as to be able to affirm with great positiveness that living beings are as truly subject as are not-living beings to the relational influences at both these extremes, it is justifiable to use the principles involved in the phenomena at these two extremes in formulating a criterion of relational influence that is not only organic but developmentally organic.

Taking due cognizance, now, of the unequivocal fact that every body known to us which either at this time is, or at any past time has been, truly living, has both undergone many and profound changes (growing, developing and adult functioning) and has maintained its individuality and identity, we are able to give a definition of organic relational influence so broad that it can be used in any examination of such influence as we may undertake, no matter into how much detail we may wish to go. Or, recalling our perception of the need for some such word as conferentiation with which to designate the general idea of such influence, we can now give a definition of the new word that will serve as the criterion we are after: *Conferentiation is that process in the living world which is the creative antithesis*

of differentiation. It consists fundamentally in the establishment of a relation among living bodies and parts of these such that while the bodies and parts maintain their individuality and identity, they undergo some measure of change. It is that relational action in living bodies which, while producing determinative changes in the bodies, at the same time leaves the individuality of these not only identifiable and unimpaired, but even improved relative to their former states.

This conception firmly grasped may serve as a touchstone, so it seems to me, for testing an enormous range of phenomena of living nature. Not only the whole sweep of purely physical structure and function (the provinces of morphology and physiology), but the great and vastly more vital and appealing realm of human life in its higher reaches (the provinces of psychology, sociology, politics, esthetics, religion, and the rest), can be illuminated by conscientiously applying the criterion. What results from such application in morphology and physiology is exhibited in some detail in Part II, *The Constructive Side of the Organismal Conception* of my book, *The Unity of the Organism.* Systematic application of the criterion lies beyond the purpose of this article. A few illustrations do, however, seem desirable. I shall give three, selecting them from widely separated provinces of the realm of life. These selections will appertain to the relation between parts in the *individual* of higher organisms, to the relation between individuals in the *primary organic groupings of higher organisms,* and to the relation between groups of individuals in *advanced societies* of the human species.

(To be continued)

WILLIAM E. RITTER.

LA JOLLA, CALIFORNIA.

DR. RUML'S CRITICISM OF MENTAL TEST METHODS

IN a recent discussion of "the need for an examination of certain hypotheses of mental tests," [1] Dr. Beardsley Ruml characterizes the results of mental tests as "astonishingly meager in theoretical value," laments the "unproductiveness of the field in propositions of fundamental significance," and criticizes investigators for their failure to find "generalizations of interpretative value in their own material."

This "fruitlessness of the mental test field" and the consequent "waste of scientific talent" is attributed to the persistence of habits of thinking about intelligence which are founded "not upon mani-

[1] This JOURNAL, Vol. XVII, pp. 57–61.